LISTING OF ALL CLAIMS:

1. (Original) A method of automated acquisition of a QAM signal, said method employing a state machine progressing from an initial state to a final state; said state machine comprising: a symbol timing recovery loop; a carrier loop; a coarse frequency loop; and an equalizer; said method comprising the steps of:

(A) Performing an automatic gain control (AGC) operation on said incoming QAM signal to maintain a steady amplitude of said QAM signal;

(B) Performing a symbol timing recovery of said input QAM signal by adjusting a sampling clock of said symbol timing recovery loop;

(C) Performing a Blind Equalization of said QAM signal without carrier lock to minimize a dispersion error of said received QAM signal constellation as compared with an error-free QAM signal constellation by adjusting a set of coefficients of said equalizer;

(D) Performing a carrier recovery of said QAM signal to eliminate a residual carrier frequency error and to eliminate a phase error from said acquired QAM signal;

and

(E) Performing a decision directed equalization (DDE) of said QAM signal by updating a set of coefficients of said equalizer by using a decision based algorithm.

2. (Original) The method of claim 1, wherein said step (A) of performing said automatic gain control (AGC) operation on said incoming QAM signal further includes the step of:

(A1) causing said state machine to enter state "1A".

3. (Original) The method of claim 2, wherein said step (A1) of performing said automatic gain control (AGC) operation while said state machine stays in said state "1A further includes the step of:

(A1,1) computing, averaging and comparing to a target level an output power at Nyquist filter, wherein said output power represents the average power in said QAM signal constellation, and wherein an error signal between said average power

in said QAM signal constellation and said output target power level is used to maintain a steady QAM signal amplitude.

4. (Original) The method of claim 1, wherein said step (A) of performing said automatic gain control (AGC) operation on said incoming QAM signal further includes the step of:

(A2) causing said state machine to enter state "1B".

5. (Original) The method of claim 4, wherein said step (A2) of performing said automatic gain control (AGC) operation while said state machine stays in said state "1B" further includes the step of:

(A2,1) performing a coarse frequency estimation of said QAM signal frequency drift over a long period of time due to aging, temperature changes, humidity changes, etc., in order to obtain a set of frequency corrections, and to apply said set of frequency corrections to a set of frequency offsets in said coarse frequency loop.

6. (Original) The method of claim 1, wherein said step (B) of performing said symbol timing recovery of said input QAM signal further comprises the step of:

(B1) causing said state machine to enter state "2".

7. (Original) The method of claim 6, wherein said step (B1) of performing said symbol timing recovery of said input QAM signal while said state machine stays in said state "2" further comprises the step of:

(B1,1) adjusting said sampling clock of said symbol timing recovery loop re-adjusting said sampling clock of said symbol timing recovery loop to optimize said symbol timing recovery of said input QAM signal.

8. (Original) The method of claim 1, wherein said step (B) of performing said symbol timing recovery of said input QAM signal further comprises the step of:

(B2) causing said state machine to enter state "3".

9. (Original) The method of claim 7, wherein said step (B2) of performing said

symbol timing recovery of said input QAM signal while said state machine stays in said state “3" further includes the step of:

(B2,1) re-adjusting said set of frequency coefficients and re-adjusting said set of phase coefficients of said symbol loop to optimize said symbol timing recovery.

10. (Original) The method of claim 1, wherein said step (C) of performing said Blind Equalization of said QAM signal without carrier lock further includes the step of:

(C1) causing said state machine to enter state “4".

11. (Original) The method of claim 10, wherein said step (C1) of performing said Blind Equalization of said QAM signal without carrier lock while said state machine stays in said state “4" further includes the step of:

(C1,1) substantially continuously performing a modulus update of said set of equalizer coefficients.

12. (Original) The method of claim 1, wherein said step (D) of performing said carrier recovery of said QAM signal further includes the step of:

(D1) causing said state machine to enter state “5A".

13. (Original) The method of claim 12, wherein said step (D1) of performing said carrier recovery of said QAM signal while said state machine stays in said state “5A" further includes the steps of:

(D1,1) adjusting said set of frequency coefficients of said carrier loop; and

(D1,2) adjusting said set of phase coefficients of said carrier loop.

14. (Original) The method of claim 1, wherein said step (D) of performing said carrier recovery of said QAM signal further includes the step of:

(D2) causing said state machine to enter state “5B".

15. (Original) The method of claim 14, wherein said step (D2) of performing said carrier recovery of said QAM signal while said state machine stays in said state

"5B" further includes the step of:

(D2,1) performing a frequency sweep if a frequency offset of said QAM signal is greater than the acquisition bandwidth of said carrier recovery loop so that said signal frequency falls within said acquisition bandwidth of said carrier recovery loop.

16. (Original) The method of claim 1, wherein said step (D) of performing said carrier recovery of said QAM signal further includes the step of:

(D3) causing said state machine to enter state "6".

17. (Original) The method of claim 16, wherein said step (D3) of performing said carrier recovery of said QAM signal while said state machine stays in said state "6" further includes the step of:

(D3,1) re-adjusting said set of frequency coefficients and said set of phase coefficients of said carrier loop to optimize said carrier acquisition of said QAM signal.

18. (Original) The method of claim 1, wherein said step (E) of performing said decision directed equalization (DDE) of said QAM signal further includes the step of:

(E1) causing said state machine to enter state "7".

19. (Original) The method of claim 18, wherein said step (E1) of performing said decision directed equalization (DDE) of said QAM signal while said state machine stays in said state "7" further includes the step of:

(E1,1) using a step size coefficient in said DDE algorithm to determine the error feedback from said carrier loop to said equalizer.

20. (Original) The method of claim 1, wherein said step (E) of performing said decision directed equalization (DDE) of said QAM further includes the step of:

(E2) causing said state machine to enter state "8".

21. (Original) The method of claim 20, wherein said step (E2) of performing said

decision directed equalization (DDE) of said QAM signal while said state machine stays in said state "8" further includes the step of:

(E2,1) re-adjusting said step size coefficient in said DDE algorithm to optimize said error feedback from said carrier loop to said equalizer.

22. (Original) The method of claim 1, wherein said step (E) of performing said decision directed equalization (DDE) of said QAM further includes the step of:

(E3) causing said state machine to enter state "9".

23. (Original) The method of claim 22, wherein said step (E3) of performing said decision directed equalization (DDE) of said QAM signal while said state machine stays in said state "9" further includes the step of:

(E3,1) tracking said QAM signal by re-adjusting said step size coefficient in said DDE algorithm.

24. (Original) The method of claim 1 further comprising the step of:

(F) cycling said state machine back to state "0".

25. (Original) The method of claim, wherein said step (F) of cycling said state machine back to said state "0" further comprises the step of:

(F1) re-acquiring a lost QAM signal while said state machine stays in said state "0", wherein said state machine is reset.

26. (Original) A method of selecting a "minimum number of QAM symbols" mode of operation of QAM modem comprising the steps of:

using a host interface to select a pair of sates" 1A"; and "5A";

and

causing said state machine to progress from said initial state "1A" to a final state "9" via said state "5A" in order to automatically acquire an incoming QAM signal;

wherein said state machine utilizes a minimum number of symbols of said incoming QAM signal to complete an acquisition of said incoming QAM signal.

27. (Original) A method of selecting a "coarse frequency" mode of operation of a QAM modem comprising the steps of:

using a host interface to select a pair of sates" 1B"; and "5A";

and

causing said state machine to progress from said initial state "1B" to a final state "9" via said state "5A" in order to automatically acquire an incoming QAM signal;

wherein a step of coarse frequency estimation of said QAM signal performed in said state "1B" compensates a frequency loop for a long term frequency drift caused by a parameter selected from the group consisting of: {aging, temperature changes, and humidity changes}.

28. (Original) A method of selecting a "QAM signal frequency sweep" mode of operation of a QAM modem comprising the steps of:

using a host interface to select a pair of states "1A"; and "5B";

and

causing said state machine to progress from said initial state "1A" to a final state "9" via said state "5B" in order to automatically acquire an incoming QAM signal;

wherein a step of frequency sweep performed in said state "5B"causes a signal frequency of said incoming QAM signal to fall within an acquisition bandwidth of a carrier recovery loop.

29. (Original) A method of selecting a "maximum number of QAM symbols" mode of operation of QAM modem comprising the steps of:

using a host interface to select a pair of sates" 1B"; and "5B";

and

causing said state machine to progress from said initial state "1B" to a final state "9" via said state "5B" in order to automatically acquire an incoming QAM signal;

wherein a step of coarse frequency estimation of said QAM signal performed in said state "1B" compensates a frequency loop for a long term frequency drift caused by a parameter selected from the group consisting of: {aging, temperature

changes, and humidity changes};

and wherein a step of frequency sweep performed in said state "5B"causes a signal frequency of said incoming QAM signal to fall within an acquisition bandwidth of a carrier recovery loop;

and wherein said state machine utilizes a maximum number of symbols of said incoming QAM signal to complete an acquisition of said QAM signal.

30. (Original) An apparatus for automated acquisition of a QAM signal, said apparatus employing a state machine progressing from an initial state to a final state; said apparatus comprising:

(A) a means for performing an automatic gain control (AGC) operation on said incoming QAM signal to maintain a steady amplitude of said QAM signal;

(B) a means for performing a symbol timing recovery of said input QAM signal;

(C) a means for performing a Blind Equalization of said QAM signal without carrier lock to minimize a dispersion error of said received QAM signal constellation as compared with an error-free QAM signal constellation;

(D) a means for performing a carrier recovery of said QAM signal to eliminate a residual carrier frequency error and to eliminate a phase error from said acquired QAM signal;

and

(E) a means for performing a decision directed equalization (DDE) of said QAM signal.

31. (Original) The apparatus of claim 30, wherein said means for performing said symbol timing recovery of said input QAM signal further includes:

a means for adjusting a sampling clock of said symbol timing recovery loop.

32. (Original) The apparatus of claim 30, wherein said means for performing said Blind Equalization of said QAM signal without carrier lock further includes:

a means for minimizing a dispersion error of said received QAM signal constellation as compared with an error-free QAM signal constellation.

33. (Original) The apparatus of claim 32, wherein said means for minimizing said dispersion error of said received QAM signal constellation as compared with said error-free QAM signal constellation further includes:

    a means for adjusting a set of coefficients of an equalizer.

34. (Original) The apparatus of claim 30, wherein said means for performing said decision directed equalization (DDE) of said QAM signal further includes:

    a means for updating a set of coefficients of said equalizer.

35. (Original) The apparatus of claim 30, wherein said means for performing said decision directed equalization (DDE) of said QAM signal further includes:

    a DDE algorithm.

36. (Original) An internal modem controller comprising:

    a modem;

    and

    a controller embedded in said modem; said controller is configured to control said modem according to a control algorithm.

37. (Original) The apparatus of claim 36, wherein said modem further comprises:

    a QAM modem.

38. (Original) The apparatus of claim 36, wherein said modem further comprises:

    a QPSK modem.

39. (Original) The apparatus of claim 36, wherein said modem further comprises:

    a Phase Shift Key (PSK) modem.

40. (Original) The apparatus of claim 37, wherein said modem comprises said QAM modem, and wherein said embedded controller is configured to control said QAM modem according to said control algorithm, said control algorithm comprising the following steps:

    (A) Performing an automatic gain control (AGC) operation on an incoming

QAM signal to maintain a steady amplitude of said QAM signal;

(B) Performing a symbol timing recovery of said input QAM signal by adjusting a sampling clock of said symbol timing recovery loop;

(C) Performing a Blind Equalization of said QAM signal without carrier lock to minimize a dispersion error of said received QAM signal constellation as compared with an error-free QAM signal constellation by adjusting a set of coefficients of said equalizer;

(D) Performing a carrier recovery of said QAM signal to eliminate a residual carrier frequency error and to eliminate a phase error from said acquired QAM signal;

and

(E) Performing a decision directed equalization (DDE) of said QAM signal by updating a set of coefficients of said equalizer by using a decision based algorithm.

LISTING OF ALL CLAIMS READABLE ON THE ELECTED GROUP I:

1. (Original) A method of automated acquisition of a QAM signal, said method employing a state machine progressing from an initial state to a final state; said state machine comprising: a symbol timing recovery loop; a carrier loop; a coarse frequency loop; and an equalizer; said method comprising the steps of:

(A) Performing an automatic gain control (AGC) operation on said incoming QAM signal to maintain a steady amplitude of said QAM signal;

(B) Performing a symbol timing recovery of said input QAM signal by adjusting a sampling clock of said symbol timing recovery loop;

(C) Performing a Blind Equalization of said QAM signal without carrier lock to minimize a dispersion error of said received QAM signal constellation as compared with an error-free QAM signal constellation by adjusting a set of coefficients of said equalizer;

(D) Performing a carrier recovery of said QAM signal to eliminate a residual carrier frequency error and to eliminate a phase error from said acquired QAM signal;

and

(E) Performing a decision directed equalization (DDE) of said QAM signal by updating a set of coefficients of said equalizer by using a decision based algorithm.

2. (Original) The method of claim 1, wherein said step (A) of performing said automatic gain control (AGC) operation on said incoming QAM signal further includes the step of:

(A1) causing said state machine to enter state "1A".

3. (Original) The method of claim 2, wherein said step (A1) of performing said automatic gain control (AGC) operation while said state machine stays in said state "1A further includes the step of:

(A1,1) computing, averaging and comparing to a target level an output power at Nyquist filter, wherein said output power represents the average power in said

QAM signal constellation, and wherein an error signal between said average power in said QAM signal constellation and said output target power level is used to maintain a steady QAM signal amplitude.

4. (Original) The method of claim 1, wherein said step (A) of performing said automatic gain control (AGC) operation on said incoming QAM signal further includes the step of:

(A2) causing said state machine to enter state “1B".

5. (Original) The method of claim 4, wherein said step (A2) of performing said automatic gain control (AGC) operation while said state machine stays in said state “1B” further includes the step of:

(A2,1) performing a coarse frequency estimation of said QAM signal frequency drift over a long period of time due to aging, temperature changes, humidity changes, etc., in order to obtain a set of frequency corrections, and to apply said set of frequency corrections to a set of frequency offsets in said coarse frequency loop.

6. (Original) The method of claim 1, wherein said step (B) of performing said symbol timing recovery of said input QAM signal further comprises the step of:

(B1) causing said state machine to enter state “2".

7. (Original) The method of claim 6, wherein said step (B1) of performing said symbol timing recovery of said input QAM signal while said state machine stays in said state “2" further comprises the step of:

(B1,1) adjusting said sampling clock of said symbol timing recovery loop re-adjusting said sampling clock of said symbol timing recovery loop to optimize said symbol timing recovery of said input QAM signal.

8. (Original) The method of claim 1, wherein said step (B) of performing said symbol timing recovery of said input QAM signal further comprises the step of:

(B2) causing said state machine to enter state “3".

9. (Original) The method of claim 7, wherein said step (B2) of performing said symbol timing recovery of said input QAM signal while said state machine stays in said state "3" further includes the step of:

(B2,1) re-adjusting said set of frequency coefficients and re-adjusting said set of phase coefficients of said symbol loop to optimize said symbol timing recovery.

10. (Original) The method of claim 1, wherein said step (C) of performing said Blind Equalization of said QAM signal without carrier lock further includes the step of:

(C1) causing said state machine to enter state "4".

11. (Original) The method of claim 10, wherein said step (C1) of performing said Blind Equalization of said QAM signal without carrier lock while said state machine stays in said state "4" further includes the step of:

(C1,1) substantially continuously performing a modulus update of said set of equalizer coefficients.

12. (Original) The method of claim 1, wherein said step (D) of performing said carrier recovery of said QAM signal further includes the step of:

(D1) causing said state machine to enter state "5A".

13. (Original) The method of claim 12, wherein said step (D1) of performing said carrier recovery of said QAM signal while said state machine stays in said state "5A" further includes the steps of:

(D1,1) adjusting said set of frequency coefficients of said carrier loop; and

(D1,2) adjusting said set of phase coefficients of said carrier loop.

14. (Original) The method of claim 1, wherein said step (D) of performing said carrier recovery of said QAM signal further includes the step of:

(D2) causing said state machine to enter state "5B".

15. (Original) The method of claim 14, wherein said step (D2) of performing said

carrier recovery of said QAM signal while said state machine stays in said state "5B" further includes the step of:

(D2,1) performing a frequency sweep if a frequency offset of said QAM signal is greater than the acquisition bandwidth of said carrier recovery loop so that said signal frequency falls within said acquisition bandwidth of said carrier recovery loop.

16. (Original) The method of claim 1, wherein said step (D) of performing said carrier recovery of said QAM signal further includes the step of:

(D3) causing said state machine to enter state "6".

17. (Original) The method of claim 16, wherein said step (D3) of performing said carrier recovery of said QAM signal while said state machine stays in said state "6" further includes the step of:

(D3,1) re-adjusting said set of frequency coefficients and said set of phase coefficients of said carrier loop to optimize said carrier acquisition of said QAM signal.

18. (Original) The method of claim 1, wherein said step (E) of performing said decision directed equalization (DDE) of said QAM signal further includes the step of:

(E1) causing said state machine to enter state "7".

19. (Original) The method of claim 18, wherein said step (E1) of performing said decision directed equalization (DDE) of said QAM signal while said state machine stays in said state "7" further includes the step of:

(E1,1) using a step size coefficient in said DDE algorithm to determine the error feedback from said carrier loop to said equalizer.

20. (Original) The method of claim 1, wherein said step (E) of performing said decision directed equalization (DDE) of said QAM further includes the step of:

(E2) causing said state machine to enter state "8".

21. (Original) The method of claim 20, wherein said step (E2) of performing said decision directed equalization (DDE) of said QAM signal while said state machine stays in said state "8" further includes the step of:

(E2,1) re-adjusting said step size coefficient in said DDE algorithm to optimize said error feedback from said carrier loop to said equalizer.

22. (Original) The method of claim 1, wherein said step (E) of performing said decision directed equalization (DDE) of said QAM further includes the step of:

(E3) causing said state machine to enter state "9".

23. (Original) The method of claim 22, wherein said step (E3) of performing said decision directed equalization (DDE) of said QAM signal while said state machine stays in said state "9" further includes the step of:

(E3,1) tracking said QAM signal by re-adjusting said step size coefficient in said DDE algorithm.

24. (Original) The method of claim 1 further comprising the step of:

(F) cycling said state machine back to state "0".

25. (Original) The method of claim, wherein said step (F) of cycling said state machine back to said state "0" further comprises the step of:

(F1) re-acquiring a lost QAM signal while said state machine stays in said state "0", wherein said state machine is reset.

30. (Original) An apparatus for automated acquisition of a QAM signal, said apparatus employing a state machine progressing from an initial state to a final state; said apparatus comprising:

(A) a means for performing an automatic gain control (AGC) operation on said incoming QAM signal to maintain a steady amplitude of said QAM signal;

(B) a means for performing a symbol timing recovery of said input QAM signal;

(C) a means for performing a Blind Equalization of said QAM signal without carrier lock to minimize a dispersion error of said received QAM signal

constellation as compared with an error-free QAM signal constellation;

(D) a means for performing a carrier recovery of said QAM signal to eliminate a residual carrier frequency error and to eliminate a phase error from said acquired QAM signal;

and

(E) a means for performing a decision directed equalization (DDE) of said QAM signal.

31. (Original) The apparatus of claim 30, wherein said means for performing said symbol timing recovery of said input QAM signal further includes:

a means for adjusting a sampling clock of said symbol timing recovery loop.

32. (Original) The apparatus of claim 30, wherein said means for performing said Blind Equalization of said QAM signal without carrier lock further includes:

a means for minimizing a dispersion error of said received QAM signal constellation as compared with an error-free QAM signal constellation.

33. (Original) The apparatus of claim 32, wherein said means for minimizing said dispersion error of said received QAM signal constellation as compared with said error-free QAM signal constellation further includes:

a means for adjusting a set of coefficients of an equalizer.

34. (Original) The apparatus of claim 30, wherein said means for performing said decision directed equalization (DDE) of said QAM signal further includes:

a means for updating a set of coefficients of said equalizer.

35. (Original) The apparatus of claim 30, wherein said means for performing said decision directed equalization (DDE) of said QAM signal further includes:

a DDE algorithm.